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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 10/024,045 | 12/17/2001 | Daisuke Kaji | KON-1695 | 5425 |

20311 7590 05/17/2005

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EXAMINER

PERUNGAVOOR, SATHYANARAYA V

ART UNIT

PAPER NUMBER

2625

DATE MAILED: 05/17/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/024,045 ✓

Applicant(s)

KAJI, DAISUKE

Examiner

Sath V. Perungavoor

Art Unit

2625

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 March 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-81 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-81 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

[1] Applicant's election with traverse reply filed on 01 March 2005 is acknowledged.

Summary of Arguments:

Applicant traverses of the examiner's restriction requirement and state that the generic claim encompasses all Figures. Hence, the applicant asserts that there is but a single invention and examination should be conducted on all presented claims.

Examiner's Response:

Agreed. Applicant's traverse of the examiner's restriction requirement is found to be persuasive; accordingly the examiner withdraws the election of species restriction made on the 07 February 2005 official action. All claims filed on 17 December 2001 have been examined.

Summary of Arguments:

Applicant asserts that 1 to 13 and 39 to 79 are of the same species corresponding to Figure 1.

Examiner's Response:

Examiner has taken this into consideration when making the prior art rejection as for this official action.

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Priority

[2] Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119(a)-(d). The certified copy has been filed in parent Application No. JP 2000-385405, filed on 19 December 2000.

[3] Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119(a)-(d). The certified copy has been filed in parent Application No. JP 2000-385406, filed on 19 December 2000.

Specification

[4] The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: "Multiresolution Unsharp Image Processing Apparatus". Any alternative title the applicant feels better suits the instant invention should allude to unsharp image processing.

[5] The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

[6] The following is a quotation of the appropriate paragraphs of 37 CFR 1.73:

A brief summary of the invention indicating its nature and substance, which may include a statement of the object of the invention, should precede the detailed description. Such summary should, when set forth, be commensurate with the invention as claimed and any object recited should be that of the invention as claimed.

- Summary is not brief; examiner notices that the applicant merely copied the claims to construct the summary. A brief summary should not contain trivial repetitions and circumlocutory language. Brief summary should enable one to quickly determine the substance of the invention.

Claim Objections

[7] Claims 14 and 72 are objected to because of the following informalities:

- Claim 14, line 19 recites “form”, this should be changed to “from”.
- Claim 72, line 1 recites “apparatus of claim 39”, this should be changed to “apparatus of claim 69”

Appropriate correction is required.

Claim Rejections - 35 USC § 112

[8] Claims 1 and 14 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Applicant’s disclosure does not describe the differential processing section 12 performing the “differences between said unsharp image-signals and said converted unsharp image-signals”.

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Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

[9] Claims 1-81 are rejected under 35 U.S.C. 102(b) as being anticipated by Ito et al. (hereinafter “Ito”) [US 5,991,457].

Rejections for claims 1-26 are based on page 48 of the disclosure. Following is the relevant citation:

Differential processing section 12 produces a difference between the converted image signal that was obtained as described above and the original image signal, and a difference between the unsharp image signal and the converted image signal. The differential image signal that is obtained here is a difference between two unsharp image signals in a pair of adjacent frequency bands or a difference between the original image signal and the converted unsharp image signal. Addition processing section 13 obtains a high

Regarding claim 1, Ito discloses all the claim limitations, as follows:

An image-processing apparatus, in which a high-frequency component signal of an original image-signal, representing a plurality of pixels, is added to either said original image-signal or a lowest frequency image-signal of said original image-signal, in order to generate a processed image-signal, comprising [Column 15 Equation 6: Disclosed invention involves adding the high frequency component to the original

image.]; a conversion-processing section to apply a conversion-processing to unsharp image-signals, generated from said original image-signal in respect to a plurality of frequency bands, so as to generate converted unsharp image-signals [*Column 15 Equation 6: F_{usm} meets this limitation.*]; a differential processing section to generate differential image-signals obtained from differences between said unsharp image-signals and said converted unsharp image-signals [*Column 15 Equation 6*]; and an addition-processing section to totally add said differential image-signals to generate said high-frequency component signal of said original image-signal [*Column 15 Equation 6*].

Regarding claim 2, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 1, wherein said differential image-signals derive from either differences between said unsharp image-signals in an adjacent pair of said frequency-bands or differences between said original image-signal and said converted unsharp image-signals [*Column 15 Equation 6: Disclosed invention involves generating differential image signals from unsharp image-signals in an adjacent pair of frequency bands.*].

Regarding claim 3, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 1, wherein said conversion-processing is to convert pixel values of said unsharp image-

signals, based on a non-linear transform *[Figure 27: Disclosed conversion function is non-linear.]*.

Regarding claim 4, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 1, wherein said conversion-processing is determined by said original image-signal or said unsharp image-signals in said plurality of frequency-bands *[Column 15 Equation 6: F_{usm} is determined by unsharp image-signals in a plurality of frequency bands.]*.

Regarding claim 5, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 1, wherein said conversion-processing is determined by said original image-signal or said unsharp image-signals in adjacent pairs of frequency-bands *[Column 15 Equation 6: F_{usm} is determined by unsharp image-signals in adjacent frequency bands.]*.

Regarding claim 6, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 1, wherein said conversion-processing varies depending on either one of pixel value of said unsharp image-signals employed for generating said differential image-signals or pixel values of said original image-signal *[Column 15*

Equation 6: F_{usm} is determined by pixel value of the unsharp image-signals.]

Regarding claim 7, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 1, wherein said conversion-processing varies depending on said unsharp image-signals [Column 15 Equation 6, Figure 27: F_{usm} varies according to the unsharp image-signals.]

Regarding claim 8, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 1, wherein said conversion-processing is a suppression-processing for suppressing an averaging-processing for averaging image-signals [Column 15 Lines 53-62].

Regarding claim 9, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 1, wherein said conversion-processing varies depending on pixel values of said unsharp image-signals to be processed by said conversion-processing [Column 15 Equation 6, Figure 27: F_{usm} varies according to the pixel value of the unsharp image signals.]

Regarding claim 10, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 1, wherein said conversion-processing varies depending on pixel values of a unsharp image-signal at a lowest frequency-band [*Column 15 Equation 6, Figure 27: Figure 27 shows a myriad of conversion curves that could be used and each of which corresponds frequency characteristics of the unsharp signals. The bottom curve corresponds to the lowest frequency component. $S_{usN-1} - S_{usN}$ is the lowest frequency band unsharp image signal.*].

Regarding claim 11, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 1, wherein said conversion-processing varies depending on pixel values of said original image-signal [*Column 15 Equation 6: S_{org} is the original image signal in the conversion function $f1$.*].

Regarding claim 12, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 8, wherein the lower a frequency-band in which said unsharp image-signals reside is, the greater a degree of suppressing said averaging-action for averaging said image-signals in said suppression-processing is [*Column 21 Lines 32-37, Figure 27: Restriction (i.e. suppression) becomes higher as the frequency becomes lower frequency.*].

Regarding claim 13, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 8, wherein the higher a frequency-band in which said unsharp image-signals reside is, the stronger a power of suppressing said averaging-action for averaging said image-signals in said suppression-processing is *[Column 20 Lines 54-61, Figure 27: Restriction (i.e. suppression) becomes higher as the frequency becomes higher frequency.]*.

Regarding claim 14, Ito discloses all the claim limitations, as follows:

An image-processing apparatus, in which a compensation-signal generated from a low-frequency component signal of an original image-signal, representing a plurality of pixels, is added to either said original image-signal or a lowest frequency image-signal of said original image-signal, in order to generate a processed image-signal, comprising *[Column 31 Equation 13: Disclosed invention involves adding the low frequency component to the original image.]*; a conversion-processing section to apply a conversion-processing to unsharp image-signals, generated from said original image-signal in respect to a plurality of frequency bands, so as to generate converted unsharp image-signals *[Column 31 Equation 13: F_{drc} meets this limitation.]*; a differential processing section to generate differential image-signals obtained from differences between said unsharp image-signals and said converted unsharp image-signals *[Column 31 Equation 13]*; and a compensation-signal calculating section to totally add said differential image-signals so as to generate a high-frequency

component signal, and to calculate said compensation-signal by subtracting said low-frequency component signal from a converted low-frequency component signal, which is derived from a difference between said high-frequency component signal and said original image-signal *[Column 31 Equation 13]*.

Regarding claim 15, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 14, wherein said differential image-signals are derived from either differences between said unsharp image-signals in adjacent pairs of said frequency-bands or differences between said original image-signal and said converted unsharp image-signals *[Column 31 Equation 13: Disclosed invention involves generating differential image signals from unsharp image-signals in an adjacent pair of frequency bands.]*.

Regarding claim 16, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 14, wherein said conversion-processing is to convert pixel values of said unsharp image-signals, based on a non-linear transform *[Figure 27: Disclosed conversion function is non-linear.]*.

Regarding claim 17, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 14, wherein said conversion-processing is determined by said original image-signal or said unsharp image-signals in said plurality of frequency-bands [Column 31 Equation 13: F_{drc} is determined by unsharp image-signals in a plurality of frequency bands.]

Regarding claim 18, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 14, wherein said conversion-processing is determined by said original image-signal or said unsharp image-signals in an adjacent pair of frequency-bands [Column 31 Equation 13: F_{drc} is determined by unsharp image-signals in adjacent frequency bands.]

Regarding claim 19, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 14, wherein said conversion-processing varies depending on either one of pixel value of said unsharp image-signals employed for generating said differential image-signals or pixel values of said original image-signal [Column 31 Equation 13: F_{drc} is determined by pixel value of the unsharp image-signals.]

Regarding claim 20, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 14, wherein said conversion-processing varies depending on said unsharp image-signals *[Column 31 Equation 13: F_{drc} varies according to the unsharp image-signals.]*.

Regarding claim 21, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 14, wherein said conversion-processing is a suppression-processing for suppressing an averaging-processing for averaging image-signals *[Column 15 Lines 53-62]*.

Regarding claim 22, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 14, wherein said conversion-processing varies depending on pixel values of said unsharp image-signals to be processed by said conversion-processing *[Column 31 Equation 13: F_{drc} varies according to the pixel value of the unsharp image signals.]*.

Regarding claim 23, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 14, wherein said conversion-processing varies depending on pixel values of a unsharp image-signal at a lowest frequency-band *[Column 31 Equation 13, Figure 27: Figure 27 shows a myriad of conversion curves that could be used and*

each of which corresponds frequency characteristics of the unsharp signals. The bottom curve corresponds to the lowest frequency component. $S_{usN-1} - S_{usN}$ is the lowest frequency band unsharp image signal.].

Regarding claim 24, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 14, wherein said conversion-processing varies depending on pixel values of said original image-signal [Column 31 Equation 13: S_{org} is the original image signal in the conversion function $f1$.].

Regarding claim 25, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 21, wherein the lower a frequency-band in which said unsharp image-signals reside is, the greater a degree of suppressing said averaging-processing for averaging said image-signals in said suppression-processing is [Column 21 Lines 32-37, Figure 27: Restriction (i.e. suppression) becomes higher as the frequency becomes lower frequency.].

Regarding claim 26, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 21, wherein the higher a frequency-band in which said unsharp image-signals reside is, the stronger a power of suppressing said averaging-action for averaging said image-signals in said suppression-processing is [Column 20 Lines 54-61, Figure

27: Restriction (i.e. suppression) becomes higher as the frequency becomes higher frequency.].

Regarding claim 27, Ito discloses all the claim limitations, as follows:

An image-processing apparatus, comprising: an unsharp image-signal generating section to generate unsharp image-signals from an original image-signal in respect to a plurality of frequency-bands [*Column 16 Equation 7: $S_{us1} \dots S_{usN}$ represent the unsharp image signals.*]; a differential processing section to generate differential image-signals from differences between said original image-signal and said unsharp image-signals, and to apply a conversion-processing to said differential image-signals so as to generate converted differential image-signals [*Column 16 Equation 7: F_{usm} meets this limitation.*]; and an addition processing section to add said converted differential image-signals to said original image-signal or a lowest frequency image-signal to generate a processed image-signal [*Column 16 Equation 7: Disclosed invention involves adding to the original image.*]; wherein said conversion-processing varies depending on pixel values of said unsharp image-signals [*Column 16 Equation 7: F_{usm} is determined by pixel value of the unsharp image-signals.*].

Regarding claim 28, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 27, further comprising: a compensation-signal calculating section to generate a compensation-signal

which is derived from a low-frequency component signal obtained by subtracting a total sum of said converted differential image-signals from said original image-signal *[Column 32 Equation 14]*; wherein said addition processing section adds said compensation-signal, instead of said converted differential image-signals, to said original image-signal or said lowest frequency image-signal to generate said processed image-signal *[Column 32 Equation 14: Disclosed invention involves adding to the original image.]*.

Regarding claim 29, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 28, wherein said differential image-signals derive from either differences between said unsharp image-signals in adjacent pairs of said frequency-bands or differences between said original image-signal and said unsharp image-signals *[Column 16 Equation 7, Column 32 Equation 14: Disclosed invention involves generating differential image signals from the differences between said original image signal and said unsharp image signals.]*.

Regarding claim 30, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 28, wherein said differential image-signals on which said conversion-processing depends are either anyone of image-signals utilized for obtaining said differential

image-signals or both of them [*Column 16 Equation 7, Column 32 Equation 14: Disclosed invention involves both signals.*].

Regarding claim 31, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 28, wherein said conversion-processing applied to said differential image-signals varies depending on said differential image-signals [*Column 16 Equation 7, Column 32 Equation 14*].

Regarding claim 32, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 28, wherein said conversion-processing applied to said differential image-signals is a suppression-processing for suppressing an absolute pixel value at least at a part of image-signals [*Column 15 Lines 53-62*].

Regarding claim 33, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 32, wherein the lower a frequency-band in which said differential image-signals reside is, the stronger a power of suppressing said absolute pixel value of said image-signals in said suppression-processing is [*Column 21 Lines 32-37, Figure 27: Restriction (i.e. suppression) becomes higher as the frequency becomes lower frequency.*].

Regarding claim 34, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 32, wherein the higher a frequency-band in which said differential image-signals reside is, the stronger a power of suppressing said absolute pixel value of said image-signals in said suppression-processing is *[Column 20 Lines 54-61, Figure 27: Restriction (i.e. suppression) becomes higher as the frequency becomes higher frequency.]*.

Regarding claim 35, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 28, wherein a conversion-function is determined by designating a frequency characteristic, so as to realize a given frequency characteristic, and processing are conducted on the basis of said conversion-function *[Figure 27]*.

Regarding claim 36, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 35, wherein said frequency characteristic can be changed depending on density *[Column 15 Lines 42-49: Changes in density are inherently related to changes in frequency characteristics.]*.

Regarding claim 37, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 35, wherein said frequency characteristic can be changed depending on density of either

said original image-signal or said unsharp image-signals for every differential image-signal *[Column 15 Lines 42-49, Column 16 Equation 7, Column 32 Equation 14: Both are disclosed.]*.

Regarding claim 38, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 35, wherein sets of parameters for processing said frequency characteristic are provided in said image-processing apparatus, a kind of processing can be designated by selecting one set out of said sets of parameters *[Figure 27: Sets of curves (parameters) are provided and one set is chosen.]*.

Regarding claim 39, Ito discloses all the claim limitations, as follows:

An image-processing apparatus, comprising: a filter-processing section to apply a mask-processing to an original image-signal, representing a plurality of pixels, with a mask so as to generate filtered original image-signals *[Column 10 Lines 49-53]*; an unsharp image-signal generating section to generate unsharp image-signals from said filtered original image-signals *[Column 10 Lines 49-53: Low pass filtered signal is the unsharp image signal.]*; a differential processing section to generate differential image-signals from differences between said original image-signal and said unsharp image-signals, or from differences between said unsharp image-signals themselves *[Column 15 Equation 6: Disclosed invention involves generating differential image signals from unsharp*

image-signals.]; and an addition processing section to add said differential image-signals to said original image-signal or a lowest frequency image-signal with respect to said original image-signal in order to generate a processed image-signal [*Column 15 Equation 6: Disclosed invention involves adding to the original image.];* wherein a frequency characteristic of said processed image-signal can be varied by changing a frequency characteristic of said mask employed for said mask-processing [*Column 10 Equation 4].*

Regarding claim 40, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 39, further comprising: a compensation-signal calculating section to generate a compensation-signal which is derived from a low-frequency component signal obtained by subtracting a total sum of said differential image-signals from said original image-signal [*Column 31 Equation 13];* wherein said addition processing section adds said compensation-signal, instead of said differential image-signals, to said original image-signal or said lowest frequency image-signal to generate said processed image-signal [*Column 31 Equation 13: Disclosed invention involves adding to the original image.].*

Regarding claim 41, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 40, wherein said mask-processing is repetitions of filtering-processing with a specific filter
[Column 10 Lines 35-38].

Regarding claim 42, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 41, wherein said mask employed for said repetitions of filter-processing is a simple average
[Column 10 Lines 49-53: Low pass filter is an average filter.].

Regarding claim 43, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 41, wherein said mask employed for said repetitions of filter-processing is a simple average of 2 pixels \times 2 pixels *[Column 10 Lines 49-53, Column 13 Lines 35-38: Low pass filter is an average filter.].*

Regarding claim 44, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 40, wherein a number of said repetitions of filter-processing designates said frequency characteristic of said processed image-signal *[Column 11 Lines 29-32].*

Regarding claim 45, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 40, wherein said frequency characteristic of said processed image-signal is specified by

designating weight of said mask with variance values of a normal distribution, and a number of said repetitions of filter-processing, which is approximate to said variance values of said normal distribution, is calculated to process image-signals [*Column 11 Equation 5*].

Regarding claim 46, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 40, wherein said mask-processing varies depending on said unsharp image-signals [*10f-10i on Figure 13*].

Regarding claim 47, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 40, wherein said mask-processing varies depending on said original image-signal [*10e on Figure 13*].

Regarding claim 48, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 40, wherein said mask-processing varies depending on a frequency characteristic of said original image-signal [*10e on Figure 13*].

Regarding claim 49, Ito discloses all the claim limitations, as follows:

An image-processing apparatus, comprising: an unsharp image-signal generating section that employs a pyramid algorithm to generate a

plurality of unsharp image-signals, resolutions of which are different relative to each other, from a original image-signal representing a plurality of pixels [10e –10i on Figure 13]; a differential processing section to generate differential image-signals from differences between said original image-signal and said unsharp image-signals, or from differences between said unsharp image-signals themselves [Column 15 Equation 6: *Disclosed invention involves generating differential image signals from unsharp image-signals.*]; and an addition processing section to add said differential image-signals to said original image-signal or a lowest frequency image-signal with respect to said original image-signal in order to generate a processed image-signal [Column 15 Equation 6: *Disclosed invention involves adding to the original image.*]; wherein a frequency characteristic of said processed image-signal can be varied by changing an interpolation-processing method for adding or subtracting said unsharp image-signals [11e –11i on Figure 13].

Regarding claim 50, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 49, further comprising: a compensation-signal calculating section to generate a compensation-signal which is derived from a low-frequency component signal obtained by subtracting a total sum of said differential image-signals from said original image-signal [Column 31 Equation 13]; wherein said addition processing section adds said compensation-signal, instead of said differential image-

signals, to said original image-signal or said lowest frequency image-signal to generate said processed image-signal *[Column 31 Equation 13:*

Disclosed invention involves adding to the original image.].

Regarding claim 51, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 50, wherein said interpolation-processing is repetitions of filter-processing with a specific filter *[Column 10 Lines 35-38]*.

Regarding claim 52, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 51, wherein a mask employed for said repetitions of filter-processing is a simple average *[Column 10 Lines 49-53: Low pass filter is an average filter.]*.

Regarding claim 53, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 51, wherein a mask employed for said repetitions of filter-processing is a simple average of 2 pixels \times 2 pixels *[Column 10 Lines 49-53, Column 13 Lines 35-38: Low pass filter is an average filter.]*.

Regarding claim 54, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 50, wherein a number of said repetitions of filter-processing designates said frequency characteristic of said processed image-signal [*Column 11 Lines 29-32*].

Regarding claim 55, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 50, wherein said interpolation-processing is performed on the basis of a sampling function of said original image-signal [*Column 11 Equation 5*].

Regarding claim 56, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 50, wherein said interpolation-processing is a linear-interpolation processing [*Column 11 Lines 66-67: Disclosed one-dimension interpolation filter performs the linear interpolation operation.*].

Regarding claim 57, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 50, wherein said interpolation-processing is a spline-interpolation processing [*Column 11 Lines 50-51*].

Regarding claim 58, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 50, wherein said interpolation-processing varies depending on a frequency band of a

interpolated image-signal *[11e –11i on Figure 13: Interpolation depends on the frequency bands and the original image signal.]*.

Regarding claim 59, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 50, wherein said interpolation-processing varies depending on said original image-signal *[11e –11i on Figure 13: Interpolation depends on the frequency bands and the original image signal.]*.

Regarding claim 60, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 50, wherein said interpolation-processing varies depending on a frequency characteristic of said original image-signal *[11e –11i on Figure 13: Interpolation depends on the frequency bands and the original image signal.]*.

Regarding claim 61, Ito discloses all the claim limitations, as follows:

An image-processing apparatus, comprising: an unsharp image-signal generating section that employs a pyramid algorithm to generate a plurality of unsharp image-signals, resolutions of which are different relative to each other, from a original image-signal representing a plurality of pixels *[10e –10i on Figure 13]*; a differential processing section to generate differential image-signals from differences between said original image-signal and said unsharp image-signals, or from differences between

said unsharp image-signals themselves [*Column 15 Equation 6: Disclosed invention involves generating differential image signals from unsharp image-signals.*]; and an addition processing section to add said differential image-signals to said original image-signal or a lowest frequency image-signal with respect to said original image-signal in order to generate a processed image-signal [*Column 15 Equation 6: Disclosed invention involves adding to the original image.*]; wherein a mask-processing is employed for generating said unsharp image-signals in a process of said pyramid algorithm, and a reduction rate of said unsharp image signals, caused by a down sampling-processing, varies depending on a frequency characteristic of a mask [*Column 10 Lines 35-38, Column 10 Lines 44-53*].

Regarding claim 62, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 61, further comprising: a compensation-signal calculating section to generate a compensation-signal which is derived from a low-frequency component signal obtained by subtracting a total sum of said differential image-signals from said original image-signal [*Column 31 Equation 13*]; wherein said addition processing section adds said compensation-signal, instead of said differential image-signals, to said original image-signal or said lowest frequency image-signal to generate said processed image-signal [*Column 31 Equation 13: Disclosed invention involves adding to the original image.*].

Regarding claim 63, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 62, wherein said mask-processing is repetitions of filtering-processing with a specific filter
[Column 10 Lines 35-38].

Regarding claim 64, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 62, wherein said mask employed for said repetitions of filter-processing is a simple average
[Column 10 Lines 49-53: Low pass filter is an average filter.].

Regarding claim 65, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 62, wherein said mask employed for said repetitions of filter-processing is a simple average of 2 pixels \times 2 pixels *[Column 10 Lines 49-53, Column 13 Lines 35-38: Low pass filter is an average filter.].*

Regarding claim 66, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 62, wherein said mask-processing varies depending on said unsharp image-signals *[10f-10i on Figure 13].*

Regarding claim 67, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 62, wherein said mask-processing varies depending on said original image-signal *[10e on Figure 13]*.

Regarding claim 68, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 62, wherein said mask-processing varies depending on a frequency characteristic of an original image-signal *[10e on Figure 13]*.

Regarding claim 69, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 62, wherein a variation of said frequency characteristic of said mask or a change of an interpolation-processing is determined by designating a frequency characteristic *[Column 10 Lines 35-38 and 49-53: Mask is successively adjusted to the low pass frequency characteristic.]*.

Regarding claim 70, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 69, wherein said designated frequency characteristic can be changed depending on a density of said original image-signal or said unsharp image-signals *[Column 15 Lines 42-49: Changes in density are inherently related to changes in frequency characteristics.]*.

Regarding claim 71, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 69, wherein said designated frequency characteristic can be changed depending on a density of said original image-signal or said unsharp image-signals for each of said unsharp image-signals and said differential image-signals *[Column 15 Lines 42-49: Changes in density are inherently related to changes in frequency characteristics.]*.

Regarding claim 72, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 69, wherein sets of parameters for processing said frequency characteristic are provided in said image-processing apparatus, a kind of processing can be designated by selecting one set out of said sets of parameters *[Column 10 Equation 4: A sets of values for σ and t are provided and one set is chosen.]*.

Regarding claim 73, Ito discloses all the claim limitations, as follows:

An image-processing apparatus, comprising: an unsharp image-signal generating section to generate a plurality of unsharp image-signals from a original image-signal, representing a plurality of pixels *[Column 15 Equation 6: $S_{us1} \dots S_{usN}$ represent the unsharp image signals.]*; a differential processing section to generate differential image-signals from said unsharp image-signals or said original image-signal *[Column 15 Equation 6]*; and an addition processing section to add said differential

image-signals to said original image-signal or a lowest frequency image-signal with respect to said original image-signal in order to generate a processed image-signal [*Column 15 Equation 6: Disclosed invention involves adding to the original image.*]; wherein repetitions of filter-processing with a specific filter are conducted for generating said unsharp image-signals [*Column 10 Lines 35-38*].

Regarding claim 74, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 73, further comprising: a compensation-signal calculating section to generate a compensation-signal which is derived from a low-frequency component signal obtained by subtracting a total sum of said differential image-signals from said original image-signal [*Column 31 Equation 13*]; wherein said addition processing section adds said compensation-signal, instead of said differential image-signals, to said original image-signal or said lowest frequency image-signal to generate said processed image-signal [*Column 31 Equation 13: Disclosed invention involves adding to the original image.*].

Regarding claim 75, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 73, wherein a mask employed for said repetitions of filter-processing is a simple average [*Column 10 Lines 49-53: Low pass filter is an average filter.*].

Regarding claim 76, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 73, wherein a mask employed for said repetitions of filter-processing is a simple average of 2 pixels \times 2 pixels [*Column 10 Lines 49-53, Column 13 Lines 35-38: Low pass filter is an average filter.*].

Regarding claim 77, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 73, wherein a mask-processing varies depending on said unsharp image-signals [*10f-10i on Figure 13*].

Regarding claim 78, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 73, wherein a mask-processing varies depending on said original image-signal [*10e on Figure 13*].

Regarding claim 79, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 73, wherein a mask-processing varies depending on a frequency characteristic of said original image-signal [*10e on Figure 13*].

Regarding claim 80, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 76, wherein a number of repetitions of said single average of $2 \text{ pixels} \times 2 \text{ pixels}$ is not less than 16
[Column 13 Line 35-38, Figure 13: Figure discloses at least four steps (i.e. $k=4$), this result in $2^4=16$ repetitions.].

Regarding claim 81, Ito discloses all the claim limitations, as follows:

The image-processing apparatus of claim 76, wherein a number of repetitions of said single average of $2 \text{ pixels} \times 2 \text{ pixels}$ is not less than 8
[Column 13 Line 35-38, Figure 13: Figure discloses at least four steps (i.e. $k=4$), this result in $2^4=16$ repetitions and $16 > 8$].


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Contact Information

[10] Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mr. Sath V. Perungavoor whose telephone number is (571) 272-7455. The examiner can normally be reached on Monday to Friday from 8:30am to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Bhavesh Mehta whose telephone number is (571) 272-7453, can be reached on Monday to Friday from 9:00am to 5:00pm. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Art Unit 2625
May 5, 2005

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